

IN THE CLAIMS:

The following is a complete listing of the claims. This listing replaces all earlier versions and listings of the claims.

Claim 1 (currently amended): An image processing method which sets correction conditions for correcting components regarding brightness of image data on the basis of a histogram corresponding to the components regarding image brightness represented by the image data, and corrects the image data according to the set correction conditions, said method comprising the steps of:

calculating a ratio of the components included within a predetermined range in the histogram; and

setting the correction conditions for correcting components regarding the brightness of the image data on the basis of the calculated ratio.

Claim 2 (currently amended): A method according to Claim 1, wherein said setting step of setting the correction conditions changes a correction for the image data, of which the components are within a predetermined range, among the set correction conditions when the calculated ratio exceeds a predetermined value, and sets the correction condition such that a correction of maintaining [[the]] a calculated component value is to be performed.

Claim 3 (currently amended): A method according to Claim 1, further comprising the steps of:

calculating a component value in the histogram, wherein a cumulative frequency accumulated from the maximum component value or the minimum component value indicates a predetermined value within a range of the component value; and

calculating the cumulative frequency from the minimum component value or the maximum component value to a predetermined component value,

wherein said setting step of setting the correction conditions discriminates a degree of lightness on the basis of the calculated component value and the cumulative frequency, and sets the correction conditions on the basis of the discriminated degree of lightness and the calculated ratio.

Claim 4 (currently amended): A method according to Claim 3, wherein said setting step of setting the correction conditions changes a correction for the image data from the minimum component value to a predetermined component value from among the correction conditions set based on the degree of lightness when the calculated ratio exceeds a predetermined value, and sets the correction condition such that a correction of maintaining the component value is to be performed.

Claim 5 (original): A method according to Claim 3, wherein said setting step of setting the correction conditions discriminates the degree of lightness on the basis of a ratio of the cumulative frequency for the number of all the pixels in the histogram.

Claim 6 (original): A method according to Claim 1, wherein the component value is a brightness value indicated by the image data.

Claim 7 (currently amended): A method according to Claim 3, wherein said setting step of setting the correction conditions discriminates the brightness of the image with plural stages on the basis of the component value, and variably sets the correction conditions ~~every~~ of the discriminated brightness classified into the plural stages.

Claim 8 (currently amended): A method according to Claim 7, wherein said setting step of setting the correction conditions discriminates a brightness distribution of the image with plural stages ~~every~~ of the discriminated brightness classified into the plural stages on the basis of the calculated ratio, and variably sets the correction conditions ~~every~~ of the discriminated brightness distribution classified into the plural stages.

Claim 9 (currently amended): A method according to Claim 1,
wherein increasing a degree of density is emphasized when a ratio of a highlight area is a large ratio as compared with a case that the ratio of the highlight area is a small ratio,

wherein decreasing a degree of density is emphasized when a ratio of a shadow area is a large ratio as compared with a case that the ratio of the shadow area is a small ratio, and

wherein expanding a degree of dynamic range is emphasized when the width of the histogram is narrow as compared with a case that the width of the histogram is wide.

Claim 10 (currently amended): An image processing method which sets a correction condition for an input image in accordance with a ratio of a shadow area in the input image, said method comprising the steps of:

setting a first correction condition for the input image in accordance with a ratio of a first shadow area in the input image; and

adjusting a correction condition for a shadow area of the first correction condition in accordance with a ratio of a second shadow area, ~~of which range is different from that of~~ included in the first shadow area, in the input image.

Claim 11 (currently amended): An image processing method which discriminates a degree of lightness of an image on the basis of a histogram related to the number of pixels of a component value regarding image brightness indicated by image data, sets a degree of correction component regarding brightness of the image data on the basis of the discriminated result, and corrects the components according to the set degree of correction component, said method comprising the steps of:

calculating a component value in the histogram wherein a cumulative frequency accumulated from the maximum value or the minimum value indicates a predetermined value within a range of the component value;

calculating a cumulative frequency accumulated from the maximum value or the minimum value to a predetermined component value in the histogram;

discriminating the degree of lightness on the basis of the calculated component value and the cumulative frequency; and

setting the degree of correction component on the basis of the discriminated result.

Claim 12 (original): A method according to Claim 11, wherein said setting step of setting the degree of correction component discriminates the degree of lightness on the basis of a ratio of the cumulative frequency to the number of pixels in the histogram.

Claim 13 (original): A method according to Claim 11, wherein the component value is a brightness value indicated by the image data.

Claim 14 (currently amended): A method according to Claim 12, wherein said setting step of setting the degree of correction component discriminates brightness of ~~[[the]]~~ an image with plural stages on the basis of the component value and variably sets the degree of correction component ~~every~~ of the discriminated brightness classified into the plural stages.

Claim 15 (currently amended): A method according to Claim 14, wherein said setting step of setting the degree of correction component discriminates a brightness distribution of the image with plural stages, ~~every~~ the discriminated brightness being classified into the plural stages on the basis of the calculated ratio and variably sets the degree of correction component ~~every~~ of the discriminated brightness distribution classified into the plural stages.

Claim 16 (currently amended): An image processing apparatus which sets correction conditions for correcting components regarding brightness of image data on the basis of a histogram corresponding to the components regarding image brightness

represented by the image data, and corrects the image data according to the set correction conditions, comprising:

calculation means for calculating a ratio of the components included within a predetermined range in the histogram; and

setting means for setting the correction conditions for correcting components regarding the brightness of the image data on the basis of the calculated ratio.

Claim 17 (currently amended): An image processing apparatus which sets a correction condition for an input image in accordance with a ratio of a shadow area in the input image, comprising:

setting means for setting a first correction condition for the input image in accordance with a ratio of a first shadow area in the input image; and

adjustment means for adjusting a correction condition for a shadow area of the first correction condition in accordance with a ratio of a second shadow area, ~~of which range is different from that of~~ included in the first shadow area, in the input image.

Claim 18 (currently amended): An image processing apparatus which discriminates a degree of lightness of an image on the basis of a histogram related to the number of pixels of a component value regarding image brightness indicated by image data, sets a degree of correction component regarding brightness of the image data on the basis of the discriminated result, and corrects the components according to the set degree of correction component, comprising:

calculation means for calculating a component value in the histogram wherein a cumulative frequency accumulated from the maximum value or the minimum value indicates a predetermined value within a range of the component value;

calculation means for calculating a cumulative frequency accumulated from the maximum value or the minimum value to a predetermined component value in the histogram;

discrimination means for discriminating the degree of lightness on the basis of the calculated component value and the cumulative frequency; and

setting means for setting the degree of correction component on the basis of the discriminated result.

Claim 19 (currently amended): A storage medium which stores a computer-readable program of a method which sets correction conditions for correcting components regarding brightness of image data on the basis of a histogram corresponding to the components regarding image brightness represented by the image data, and corrects the image data according to the set correction conditions, said ~~method~~ program comprising the steps of:

code for calculating a ratio of the components included within a predetermined range in the histogram; and

code for setting the correction conditions for correcting components regarding the brightness of the image data on the basis of the calculated ratio.

Claim 20 (currently amended): A storage medium which stores a computer-readable program of a method which sets a correction condition for an input image in

accordance with a ratio of a shadow area in the input image, said ~~method~~ program
comprising ~~the steps of~~:

code for setting a first correction condition for the input image in
accordance with a ratio of a first shadow area in the input image; and

code for adjusting a correction condition for a shadow area of the
first correction condition in accordance with a ratio of a second shadow area, ~~of which~~
~~range is different from that of~~ included in the first shadow area, in the input image.

Claim 21 (currently amended): A storage medium which stores a computer-
readable program of a method which discriminates a degree of lightness of an image on the
basis of a histogram related to the number of pixels of a component value regarding image
brightness indicated by image data, sets a degree of correction component regarding
brightness of the image data on the basis of the discriminated result, and corrects the
components according to the set degree of correction component, said ~~method~~ program
comprising ~~the steps of~~:

code for calculating a component value in the histogram wherein a
cumulative frequency accumulated from the maximum value or the minimum value
indicates a predetermined value within a range of the component value;

code for calculating a cumulative frequency accumulated from the
maximum value or the minimum value to a predetermined component value in the
histogram;

code for discriminating the degree of lightness on the basis of the
calculated component value and the cumulative frequency; and

code for setting the degree of correction component on the basis of the discriminated result.

Claim 22 (new): An image processing method comprising the steps of:
discriminating a color distribution of an image from a histogram of the image:

acquiring a gradation correction condition for correcting the image on the basis of the discrimination discriminated in said discriminating step; and
correcting the image by using the acquired gradation correction condition,

wherein the discrimination of the color distribution of the image is executed by acquiring a highlight point and a shadow point of the image from the histogram, and a cumulative frequency of a predetermined range of the histogram.

Claim 23 (new): An image processing apparatus comprising:
a discrimination unit adapted to discriminate a color distribution of an image from a histogram of the image:
an acquisition unit adapted to acquire a gradation correction condition for correcting the image on the basis of the discrimination performed by said discrimination unit; and
a correction unit adapted to correct the image by using the gradation correction condition acquired by said acquisition unit,
wherein said discrimination unit executes the discrimination of the color distribution of the image by acquiring a highlight point and a shadow point of the

image from the histogram, and a cumulative frequency of a predetermined range of the histogram.

Claim 24 (new): A storage medium which stores a computer-readable program of an image processing method, said program comprising:

code for discriminating a color distribution of an image from a histogram of the image;

code for acquiring a gradation correction condition for correcting the image on the basis of the discrimination performed by said discriminating code; and

code for correcting the image by using the acquired gradation correction condition,

wherein the discrimination of the color distribution of the image by said discriminating code is executed by acquiring a highlight point and a shadow point of the image from the histogram, and a cumulative frequency of a predetermined range of the histogram.

Claim 25 (new): A method according to claim 11, wherein, when a peak of the cumulative frequency which is larger, by a predetermined level, than the surrounding cumulative frequency exists in a predetermined range of a relatively large component value within the range of the component value, said component value calculating step includes calculating the component value, wherein the cumulative frequency, except for the peak, indicates the predetermined value.

Claim 26 (new): An image processing method for correcting brightness of image data, said method comprising the steps of:

discriminating, based on a histogram of the brightness of an image represented by the image data, a degree of lightness of the image;

acquiring, in the histogram, a ratio of cumulative frequency of a predetermined low-brightness area to the number of pixels being the targets in case of creating the histogram;

determining an extent of the correction on the basis of the discriminated degree of lightness of the image and the acquired ratio of cumulative frequency; and

correcting the brightness of the image data on the basis of the determined extent of the correction.

Claim 27 (new): An image processing method according to claim 26, wherein:

the lightness of the image is discriminated with respect to plural levels on the basis of brightness values, and

the extent of the correction is determined differently with respect to each of the discriminated levels of the lightness.

Claim 28 (new): An image processing method according to claim 27, wherein:

a distribution of the lightness of the image is discriminated with respect to each of the plural levels of the lightness, and

the extent of the correction is determined differently with respect to each of the discriminated levels of the distributions.

Claim 29 (new): An image processing method for correcting brightness of image data, said method comprising the steps of:

discriminating, based on a histogram of the brightness of an image represented by the image data, a degree of lightness of the image;

acquiring, in the histogram, a ratio of a cumulative frequency of a first low-brightness area to the number of pixels being the targets in case of creating the histogram;

determining an extent of the correction on the basis of the discriminated degree of lightness of the image and the acquired ratio of cumulative frequency;

acquiring a ratio of a cumulative frequency of a second low-brightness area, different from the first low-brightness area, to the number of pixels being the targets in case of creating the histogram; and

correcting the brightness of the image data on the basis of the determined extent of the correction and the acquired ratio of the cumulative frequency of the second low-brightness area.

Claim 30 (new): An image processing method according to claim 29, wherein, in said step of determining the extent of the correction, when the ratio of the cumulative frequency of the second low-brightness area is equal to or higher than a predetermined value, the extent of the correction is changed so that, with respect to the

image data from having a minimum brightness value to having a predetermined brightness value, the relevant brightness values are maintained.

Claim 31 (new): An image processing method according to claim 30, wherein the correction is executed when the extent of the correction is the extent of the correction of darkening the brightness.

Claim 32 (new): An image processing apparatus for correcting brightness of image data, said apparatus comprising:

a discrimination unit adapted to discriminate, based on a histogram of the brightness of an image represented by the image data, a degree of lightness of the image;

an acquisition unit adapted to acquire, in the histogram, a ratio of a cumulative frequency of a predetermined low-brightness area to the number of pixels being the targets in case of creating the histogram;

a determination unit adapted to determine an extent of the correction on the basis of the discriminated degree of lightness of the image and acquired ratio of the cumulative frequency; and

a correction unit adapted to correct the brightness of the image data on the basis of the determined extent of the correction.

Claim 33 (new): An image processing apparatus for correcting brightness of image data, said apparatus comprising:

a discrimination unit adapted to discriminate, based on a histogram of the brightness of an image represented by the image data, a degree of lightness of the image;

a first acquisition unit adapted to acquire, in the histogram, a ratio of a cumulative frequency of a first low-brightness area to the number of pixels being the targets in case of creating the histogram;

a determination unit adapted to determine an extent of the correction on the basis of the discriminated degree of lightness of the image and the acquired ratio of the cumulative frequency;

a second acquisition unit adapted to acquire a ratio of a cumulative frequency of a second low-brightness area, different from the first low-brightness area, to the number of pixels being the targets in case of creating the histogram; and

a correction unit adapted to correct the brightness of the image data on the basis of the determined extent of the correction and the acquired ratio of the cumulative frequency of the second low-brightness area.

Claim 34 (new): A storage medium which stores a program in a manner readable by an information processing apparatus, said program executing a method to achieve an image process for correcting brightness of image data, said program comprising:

code for discriminating, based on a histogram of the brightness of an image represented by the image data, a degree of lightness of the image;

code for acquiring, in the histogram, a ratio of the cumulative frequency of a predetermined low-brightness area to the number of pixels being the targets in case of creating the histogram;

code for determining an extent of the correction on the basis of the discriminated degree of lightness of the image and the acquired ratio of the cumulative frequency; and

code for correcting the brightness of the image data on the basis of the determined extent of the correction.

Claim 35 (new): A storage medium which stores a program in a manner readable by an information processing apparatus, said program executing a method to achieve an image process for correcting brightness of image data, said program comprising:

code for discriminating, based on a histogram of the brightness of an image represented by the image data, a degree of lightness of the image;

code for acquiring, in the histogram, a ratio of a cumulative frequency of a first low-brightness area to the number of pixels being the targets in case of creating the histogram;

code for determining an extent of the correction on the basis of the discriminated degree of lightness of the image and the acquired ratio of a cumulative frequency;

code for acquiring a ratio of a cumulative frequency of a second low-brightness area, different from the first low-brightness area, to the number of pixels being the targets in case of creating the histogram; and

code for correcting the brightness of the image data on the basis of the determined extent of the correction and the acquired ratio of the cumulative frequency of the second low-brightness area.

Claim 36 (new): An image processing method for correcting brightness of image data of an input process target, said method comprising the steps of:

calculating, when a peak having a frequency larger, by a predetermined level, than surrounding frequencies exists in a high-brightness area of a histogram represented by the image data, a value according to the frequency in the peak-surrounding high-brightness area, replacing the frequency of a peak-existing range of the histogram by the calculated value, and calculating a brightness value of a cumulative frequency from a maximum brightness value to a low-brightness side in the histogram of which the frequency that has been replaced indicates a predetermined value;

determining an extent of the correction based on the calculated brightness value; and

correcting the brightness of the image data based on the determined extent of the correction.

Claim 37 (new): An image processing method according to claim 36, wherein, in said calculating step, the value is acquired as an average value of the frequencies in the peak-surrounding high-brightness area.

Claim 38 (new): An image processing method comprising:

setting, so as to make a density of an output image higher than a density of an input image, an extent of a correction for the input image in accordance with a ratio of a shadow area in the input image,

wherein, in a case where the ratio of the shadow area is large, the extent of the correction is set so as to make the increase of the density small as compared with a case where the ratio of the shadow area is small.

Claim 39 (new): An image processing method according to claim 38, wherein the extent of the correction is represented by a γ parameter with respect to a component indicating lightness.

Claim 40 (new): An image processing method according to claim 39, wherein a histogram is created based on the component indicating the lightness of the input image, and the ratio of the shadow area is acquired based on the created histogram.

Claim 41 (new): An image processing apparatus for correcting brightness of image data, said apparatus comprising:

a calculation unit adapted to calculate, when a peak having a frequency larger, by a predetermined level, than surrounding frequencies exists in a high-brightness area of a histogram represented by the image data, a value according to the frequency in the peak surrounding high-brightness area, to replace the frequency of a peak-existing range of the histogram by the calculated value, and to calculate a brightness value of a cumulative frequency from a maximum brightness value to a low-brightness side in

the histogram of which the frequency that has been replaced indicates a predetermined value;

a determination unit adapted to determine an extent of the correction based on the calculated brightness value; and

a correction unit adapted to correct the brightness of the image data based on the determined extent of the correction.

Claim 42 (new): An image processing apparatus comprising:

a setting unit adapted to set, so as to make a density of an output image higher than a density of an input image, an extent of a correction for the input image in accordance with a ratio of a shadow area in the input image,

wherein, in case where the ratio of the shadow area is large, the extent of the correction is set so as to make the increase of the density small as compared with a case where the ration of the shadow area is small.

Claim 43 (new): A storage medium which stores a program in a manner readable by an information processing apparatus, said program executing a method to achieve an image process for correcting brightness of image data, said program comprising:

code for calculating, when a peak having a frequency larger, by a predetermined level, than surrounding frequencies exists in a high-brightness area of a histogram represented by the image data, a value according to the frequency in the peak-surrounding high-brightness area, replacing the frequency of a peak-existing range of the histogram by the calculated value, and calculating a brightness value of a cumulative

frequency from a maximum brightness value to a low-brightness side in the histogram of which the frequency that has been replaced indicates a predetermined value;

code for determining an extent of the correction based on the calculated brightness value; and

code for correcting the brightness of the image data based on the determined extent of the correction.

Claim 44 (new): A storage medium which stores a program in a manner readable by an information processing apparatus, said program executing a method, to achieve an image process, said program comprising:

code for setting, so as to make a density of an output image higher than a density of an input image, an extent of a correction for the input image in accordance with a ratio of a shadow area in the input image,

wherein, in a case where the ratio of the shadow area is large, the extent of the correction is set so as to make the increase of the density small as compared with a case where the ratio of the shadow area is small.